

WHAT IS CLAIMED IS:

1. A mold for forming molded products, said mold comprising:
 at least two mold parts, at least one of said at least two mold parts moveable along a mold
 5 movement path with respect to the other of said at least two mold parts; and
 a guide mechanism for guiding said at least one moveable mold part into and out of a
 mold forming position along said mold movement path in conjunction with the at least one other
 mold part, wherein said guide mechanism comprises:
 a first structure fixed to said at least one other mold part;
 10 a second structure fixed to said at least one moveable mold part, wherein one of
 said first and second structures sandwiches at least a portion of the other of said first and second
 structures; and
 a plurality of bearings separating said first and second structures and permitting
 movement along said mold movement path wherein said one of said first and second structures
 15 applies a preload pressure to said bearings in at least one direction normal to said mold
 movement path.
2. The mold according to claim 1, wherein said mold movement path is a linear mold
 movement direction.
- 20 3. The mold according to claim 1, further including a means for moving said at least one
 moveable mold part into said mold forming position.
4. The mold according to claim 1, further including a means for returning said at least
 25 one moveable mold part away from said mold forming position.
5. The mold according to claim 3, wherein said mold includes an additional moving
 structure and said means for moving comprises a cam surface in conjunction with said at least

one moveable mold part, said cam surface contacted by said moving structure and biasing said at least one moveable mold part into said mold forming position.

5 6. The mold according to claim 4, wherein said means for returning comprises a return spring biasing said at least one moveable mold part out of said mold forming position.

7. The mold according to claim 5, wherein said cam surface is planar.

8. The mold according to claim 5, wherein said cam surface is curved.

10

9. The mold according to claim 1, wherein said at least one other mold part is fixed and said first structure is fixed to said fixed mold part.

15

10. The mold according to claim 9, wherein said first structure is sandwiched between portions of said second structure.

11. The mold according to claim 2, wherein said plurality of bearing limit movement of said moveable mold part only to movement along said mold movement direction.

20

12. The mold according to claim 2, wherein a portion of said plurality of bearings are comprised of ball bearings and said first and second structures have at least two opposing surfaces into which corresponding ball bearing races are formed, said races extending in said mold movement direction.

25

13. The mold according to claim 1, wherein said mold comprises three mold parts, a top half, a bottom half and an end plug, wherein said at least one moveable mold part comprises said bottom end plug.

14. A mold for forming molded products, said mold comprising:

at least three mold parts, at least one of said at least three mold parts moveable along a mold movement direction with respect to at least one of the others of said at least three mold parts;

5 a guide mechanism for guiding said at least one moveable mold part into and out of a mold forming position along said mold movement direction in conjunction with the at least two other mold parts, wherein said guide mechanism comprises:

a first structure fixed to one of said at least two other mold parts;

10 a second structure fixed to said at least one moveable mold part, wherein one of said first and second structures sandwiches at least a portion of the other of said first and second structures; and

a plurality of bearings separating said first and second structures and permitting movement in said mold movement direction;

15 at least one spring applying a preload pressure to said bearings in at least one direction normal to said mold movement direction:

a return spring for biasing said at least one moveable mold part in one of said directions towards and away from said mold forming position; and

20 a cam for moving said at least one moveable mold part, in opposition to said return spring bias, to the other of said directions away from or towards said mold forming position.

15. The mold according to claim 14, wherein said mold is an injection blow molding mold.

25 16. The mold according to claim 14, wherein said moveable mold part is a bottom end plug for an injection blow molded mold and said others of said at least three mold parts comprise a moveable upper mold half and a fixed lower mold half.

17. The mold according to claim 14, wherein said guide structure is comprised of upper and lower bearing races, each of said bearing races formed by surfaces in each of said first and second structures, said bearing race surfaces sandwiching respective bearings

5

18. A mold for forming injection molded products, said mold comprising:
a lower mold half;

an upper mold half, one of said upper and lower mold halves moveable with respect to the other of said upper and lower mold halves;

10

a moveable bottom end plug moveable along a mold movement direction with respect to at least one of said upper mold half and said lower mold half;

a guide mechanism for guiding said bottom end plug into and out of a mold forming position along said mold movement direction in conjunction with the upper and lower mold halves, wherein said guide mechanism comprises:

15

a first structure fixed to one of said upper and lower mold halves ;

a second structure fixed to said bottom end plug, wherein one of said first and second structures has two portions, said two portions sandwiches at least one portion of the other of said first and second structures; and

a plurality of bearings separating said first and second structures and permitting movement of said bottom end plug in said mold movement direction; and

20

at least one spring applying a preload pressure to said bearings in at least one direction normal to said mold movement direction:

a return spring for biasing said bottom end plug in one of said directions towards and away from said mold forming position; and

25

a cam, operated in response to movement of one of said upper and lower mold halves, for moving said at least one moveable mold part, in opposition to said return spring bias, to the other of said directions away from or towards said mold forming position.

19. The mold according to claim 18, wherein said lower mold half is fixed and said upper mold half and said bottom end plug move relative to said lower mold half.

20. The mold according to claim 18, wherein said first structure is fixed to said lower mold half.

5 21. The mold according to claim 18, wherein said second structure sandwiches said first structure.

10 22. The mold according to claim 21, wherein said first structure has upper and lower surfaces, said second structure has surfaces opposing said first structure surfaces and, said plurality of bearings are interposed between said first structure surfaces and the opposing surfaces of said second structure.

15 23. The mold according to claim 22, wherein said plurality of bearings includes roller bearings between said first structure lower surface and the opposing lower surface of said second structure and ball bearings between said first structure upper surface and said opposing upper surface of said second structure.

20 24. The mold according to claim 23, wherein said ball bearings move in ball bearing races, one race in said first structure upper surface and one race in said opposing upper surface of said second structure.

25 25. The mold according to claim 24, wherein said ball bearing are constrained against relative translational movement by a ball bearing cage and said roller bearings are constrained against relative translational movement by a roller bearing cage.

26. The mold according to claim 25, wherein each of said cages includes an o-ring seal in contact with at least one of said first structure surfaces and said second structure surfaces.

27. The mold according to claim 18, wherein said at least two portions are relatively moveable towards and away from each other, and said spring applying a preload pressure to said bearings, forces said portions toward each other sandwiching said at least one portion and said bearings therebetween.

5

~~28.~~ A mold for forming molded products, said mold comprising:

a lower mold half;

an upper mold half, one of said upper and lower mold halves moveable with respect to the other of said upper and lower mold halves;

10

a split bottom end plug having separate upper and lower portions moveable with respect to each other, said upper and lower portions moveable along respective mold movement directions toward said upper mold half and said lower portion, respectively;

each of said upper and lower end plug portions having a guide mechanism, said guide mechanism for guiding a respective bottom end plug portion into and out of a mold forming position along said respective mold movement directions in conjunction with the upper and lower mold halves, wherein each said guide mechanism comprises:

15

a first structure fixed to said corresponding mold half;

a second structure fixed to said corresponding bottom end plug portion, wherein one of said first and second structures has two portions, said two portions sandwiches at least one portion of the other of said first and second structures; and

20

a plurality of bearings separating said first and second structures and permitting movement of said corresponding bottom end plug portion in said respective mold movement directions; and

at least one spring applying a preload pressure to said bearings in at least one

25

direction normal to said respective mold movement direction:

a return spring for biasing said corresponding bottom end plug portion in one of said directions towards and away from said mold forming position; and

one of a tab and receptacle on said upper portion for engagement with a corresponding one of a receptacle and tab on said lower portion, said engagement occurring prior to meeting of said portions during closure of said mold halves; and

- a cam, operated in response to movement of one of said upper and lower mold halves and
- 5 after said tab engages with said receptacle, for moving said corresponding bottom end plug portion, in opposition to said return spring bias, to the other of said directions away from or towards said mold forming position.